

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO WASHING AND SPIN-DRYING

(71) We, GEBR. POENSGEN GMBH, a German Company, of Bochumer Strasse 45, 4, Dusseldorf-Rath, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of and a machine for washing and spin-drying so that unbalance in spin-drying of washing in a washing and spin-drying machine in which washing is performed is reduced.

As a rule, large washing and spin-drying machines have horizontal drum axes which retain their horizontal position during the washing cycle and during the spin-drying cycle. By contrast, washing and spin-drying machines whose axis of rotation can be tilted from a substantially horizontal into a substantially vertical position and *vice versa* have substantial advantages. With this type of washing and spin-drying machine, washing is performed with the axis of rotation substantially horizontal, while spin-drying is performed with the axis of rotation substantially vertical, at a correspondingly higher rotational speed.

An object of the invention is to provide a method for washing and spin-drying machines with a tiltable axis of rotation by means of which it is possible to reduce the unbalance of the washing which normally occurs in spin-drying. The normal filling ratio of a rotating drum with washing during the washing cycle is normally 1:12 to 1:14 while a conventional spin drying filling ratio is approximately 1:5 during charging and approximately 1:7 during floating-in of the washing. The rotating drum of the washing and spin-drying machine is therefore underloaded during the spin-drying operation. A greater amount of unbalance occurs in underloaded spin-drying machines than in a fully laden spin-drying machine, because in a fully laden spin-drying machine it is impossible, or at least nearly

so, for unbalance to occur, owing to the fullness of the charge.

According to one aspect of the present invention there is provided a method of washing and spin-drying in a washing and spin-drying machine, which comprises washing the washing in a rotating drum of the machine whilst the axis of rotation of drum is substantially horizontal, slowly pivoting the axis of rotation of the drum rotating at the washing speed to a substantially vertical spin-drying position while increasing the amount of liquor in the drum, so that the washing is substantially uniformly distributed for a spin-drying operation, and thereafter spin-drying the washing by accelerating the speed of rotation of the drum.

According to a second aspect of the invention there is provided a washing and spin-drying machine suitable for carrying out the method described in the preceding paragraph comprising a rotatable drum in which washing can be washed while the axis of rotation of the drum is substantially horizontal, means for slowly pivoting the axis of rotation of the drum rotating at the washing speed after washing of the washing to a substantially vertical spin-drying position, means for increasing the amount of liquor in the drum while the rotational axis of the drum is pivoted and means for thereafter spin-drying the washing by accelerating the speed of rotation of the drum. Preferably the drum is rotatable in a housing which is pivotable therewith through at least 90° about a horizontal pivoting axis of rotation, the rotatable drum and the housing being rigidly supported in a frame, which is pivotable about a horizontal pivoting shaft, and the pivoting shaft being supported by pendulum columns, preferably four, each having a resilient buffer suspension.

Clearly, this invention is not limited to the washing with water of soiled laundry, but is applicable to the treatment of any solid

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materials by immersing in liquor and thereafter removing the liquor.

The afore-mentioned features of the invention provide the substantial advantage that the unbalance is reduced owing to the uniform distribution of the washing during the spin-drying operation. Under these circumstances, it is important for the washing to float by virtue of the increasing rinsing liquor (normally water) level. The rotating drum assumes the upright position at the washing speed. Owing to the higher liquid level the washing bears uniformly over the entire surface of the rotating drum shell by contrast to the aforementioned type of machine, in which relatively small amount of water will be in the rotating drum so that the washing is disposed packed in a thick layer in the lower part of the rotating drum and the centrifuging or spin-drying effect cannot become fully effective.

A further advantage of the invention is that after spin-drying the washing can be removed from the rotating drum more readily than in the aforementioned type of machine since it is distributed in a thin layer of washing over the entire surface of the rotating drum. There is a further advantage in that the washing normally has only an exceptionally small residual liquor (normally moisture) content after the spin-drying operation.

According to a further embodiment of the invention it is proposed that acceleration of the rotational speed of the rotating drum for the spin-drying operation begins at the end of the motion for uprighting the axis of rotation of the rotating drum, the changeover from the washing speed to the spin-drying speed taking place while the direction of rotation of the rotating drum is continued as at the beginning of the accelerating phase. Acceleration of the rotational speed may begin either briefly before or briefly after the end of uprighting by changing over the rotational speed of the washing operation into that of the spin-drying operation. A special advantage is the favourable kind of speed change from the washing to the spin-drying operation. It is known that the washing or rinsing operation is performed at a reversing cycle. It was found that the washing does not readily bear uniformly against the internal shell of the drum if the centrifuging process is started immediately after a reversing cycle. By contrast, very much smaller unbalances are created if the direction of rotation of the last rinsing cycle is retained while acceleration into the spin-drying operation takes place at the same direction of rotation. Accordingly, the beginning of acceleration for spin-drying is not left to chance but should be deliberately related to the reversing cycle.

According to a further proposal of the invention, the rinsing liquor is drained off after the rotation speed of the rotating drum be-

gins to be accelerated. This procedure also improves the manner in which the washing bears upon the internal shell of the rotating drum and thus encourages de-liquoring.

The method according to the invention ensures that in spin-drying with a vertical axis of rotation of the rotating drum the spin-drying operation proceeds uniformly, particularly if the drum is undivided. In the last mentioned case, weighing of the washing is not required.

It has been found advantageous for the amount of rinsing liquor to be approximately doubled when the axis of rotation of the rotating drums begins to be pivoted from its substantially horizontal washing position into its substantially vertical spin-drying position. This ensures optimum and uniform distribution of the washing in the rotating drum while avoiding an unnecessarily large amount of rinsing liquor.

By virtue of the preferred construction of the bearing system and support system of the rotation drum and housing, the disadvantages and defects of tiltable washing and spin-drying machines are eliminated or at least mitigated. The disadvantages and defects are mainly due to the uncertainty and instability of the housing suspension and therefore of the rotating drum and is therefore not suitable to absorb mass forces resulting from unbalance and which may become very large, in particular at high rotational speeds during spin-drying. These disadvantages and defects do not occur in at least the preferred washing and spin-drying machine according to the invention due to its novel and advantageous construction.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 shows a cross-section of a washing and spin-drying machine according to the invention in the loading and spin-drying position,

Figure 2 shows a side elevation of the machine of figure 1 in the direction of the arrow A,

Figure 3 shows a side elevation of the machine of figure 1 in the direction of the arrow A in the washing position,

Figure 4 shows a partial sectional side elevation in the direction of the arrow A of the rotating drum with the housing of the machine of figure 1 in the unloading position, and

Figure 5 shows sectional side elevation of the machine of figure 1 in the loading position, with the washing part divided into a clean and unclean side by means of a separating wall.

Referring now to the drawings, a washing and spin-drying machine 10 is provided with a rotating drum 12 in a housing 11. The

housing 11 and the rotating drum 12 can be closed at the top by a cover 13. The rotating drum 12 is supported by a spin-drying motor 14 on whose shaft 15 drum base 12a is mounted. The spin-drying motor 14 is mounted on a rolling plate 16 which is pivotably journaled about a horizontal pivoting shaft 17. The horizontal pivoting shaft 17 in turn is supported relative to the floor by means of four pendulum columns 18, each of which has a resilient buffer suspension 19.

The rolling plate 16 also retains a washing motor 20, which drives the rotating drum 12, via a reduction transmission 21, during the washing cycle. A tilting motor 22 tilts the rotating drum 12 by means of a worm transmission 23 from the loading and centrifuging position (as shown in figures 1 and 2) into the washing position (figure 3) or into the unloading position E (figure 4). The horizontal pivoting shaft 17 is disposed perpendicularly to the axis of rotation 24 of the rotating drum 12. The centre of gravity 25 of the rotating drum 12 is disposed approximately at the level of the horizontal pivoting shaft 17. The axis of rotation 24 of the rotating drum 12 can be pivoted downwardly from the vertical position (figures 1 and 2) through more than 90°, preferably through 120° (figure 4) for the purpose of unloading the washing. In the washing position (figure 3) the axis of rotation 24 and, therefore, the rotating drum 12 is pivoted through 90° relative to the vertical spin-drying position (figures 1 and 2).

The pivoting shaft 17 is advantageously constructed as a hollow shaft. As can be seen from figure 1, it may serve on the left-hand side for supplying steam and on the right-hand side for supplying water and detergent from a storage vessel 26.

If a laundry is subdivided by means of a separating wall 28 of a machine as shown in figure 5 into a clean side R and into an unclean side U, the washing machine itself will be disposed on the clean side R. The separating wall 28 is provided with a pivoting frame 30 journaled thereon by means of a hinge 29. During pivoting motion, the free end of the pivoting frame 30 sealingly bears upon an extension 28a of the separating wall 28, said extension being constructed in the form of a circular sector. The pivoting frame 30 is provided with an extension neck 31 and a cover 32 which can close the extension neck 31 which represents a filling socket. In the washing, spin-drying and unloading position the cover 32 is closed and the pivoting frame 30 is disposed approximately vertically. In the loading position the pivoting frame 30 is pivoted in the direction of the arrow 34 until the extension neck 31 bears on the opened loading aperture 33 of the washing machine in the loading position B thereof. In the loading position B, the

axis of rotation 24 of the rotating drum 12 is pivoted from its vertical position through more than 270° or less than 90°, preferably by 290° or 70°, respectively, in the embodiment shown in figure 5. After unloading from its unloading position, E, the machine is appropriately further pivoted into the loading position B according to figure 5.

WHAT WE CLAIM IS:—

1. A method of washing and spin-drying in a washing and spin-drying machine, which comprises washing the washing in a rotating drum of the machine whilst the axis of rotation of drum is substantially horizontal, slowly pivoting the axis of rotation of the drum rotating at the washing speed to a substantially vertical spin-drying position while increasing the amount of liquor in the drum, so that the washing is substantially uniformly distributed for a spin-drying operation, and thereafter spin-drying the washing by accelerating the speed of rotation of the drum.

2. A method according to Claim 1, wherein the acceleration of the rotating drum from the washing speed to the spin-drying speed is commenced at substantially the end of the pivoting of the rotational axis of the drum, the speed of the drum not going through zero during said acceleration.

3. A method according to Claim 1 or 2, wherein the liquor is drained off during acceleration of the drum.

4. A method according to Claim 1, 2 or 3, wherein the amount of liquor in the drum is substantially doubled when pivoting of the rotational axis of the drum is started.

5. A method in accordance with Claim 1, substantially as hereinbefore described with reference to the accompanying drawings.

6. A washing and spin-drying machine suitable for carrying out the method claimed in Claim 1, comprising a rotatable drum in which washing can be washed while the axis of rotation of the drum is substantially horizontal, means for slowly pivoting the axis of rotation of the drum rotating at the washing speed after washing of the washing to a substantially vertical spin-drying position, means for increasing the amount of liquor in the drum while the rotational axis of the drum is pivoted and means for thereafter spin-drying the washing by accelerating the speed of rotation of the drum.

7. A machine according to Claim 6, wherein the drum is rotatable in a housing which is pivotable therewith through at least 90° about a horizontal pivoting axis perpendicular to the axis of rotation, the rotatable drum and the housing being rigidly supported in a frame, which is pivotable about a horizontal by pendulum columns, preferably four, each having a resilient buffer suspension.

8. A machine according to Claim 6 or 7, wherein the axis of rotation of the drum is

capable of being pivoted downwardly from its substantially vertical position through more than 90° to facilitate unloading of the machine.

- 5 9. A machine according to Claim 8, wherein the axis of rotation of the drum is capable of being pivoted downwardly from its substantially vertical position through more than 120° to facilitate unloading of the machine.

- 10 10. A machine according to Claim 6, 7, 8 or 9, wherein the rotational axis of the drum is capable of being pivoted from its substantially vertical position through more than 270° or less than 90° to facilitate loading of the machine.

- 15 11. A machine according to Claim 10, wherein the rotational axis of the drum is capable of being pivoted from its substantially vertical position through more than 290° or

less than 70° to facilitate loading of the machine.

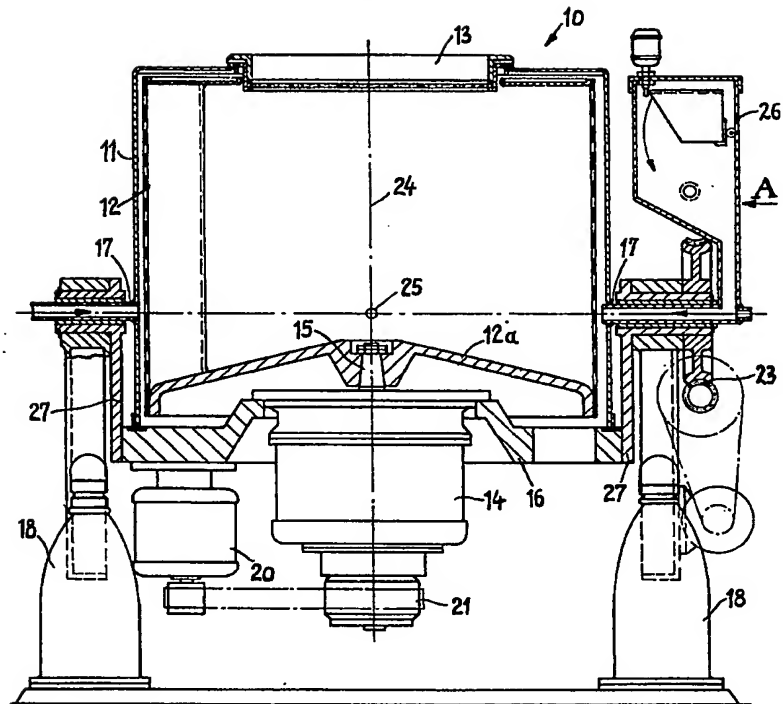
12. A machine according to Claim 10 or 11, wherein an extension neck of a frame pivotably, mounted on a wall separating the loading and unloading positions of the machine, is capable of bearing on the opened loading aperture of the housing in the loading position of the machine. 25

13. A machine in accordance with Claim 6, substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings. 30

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Fig.1



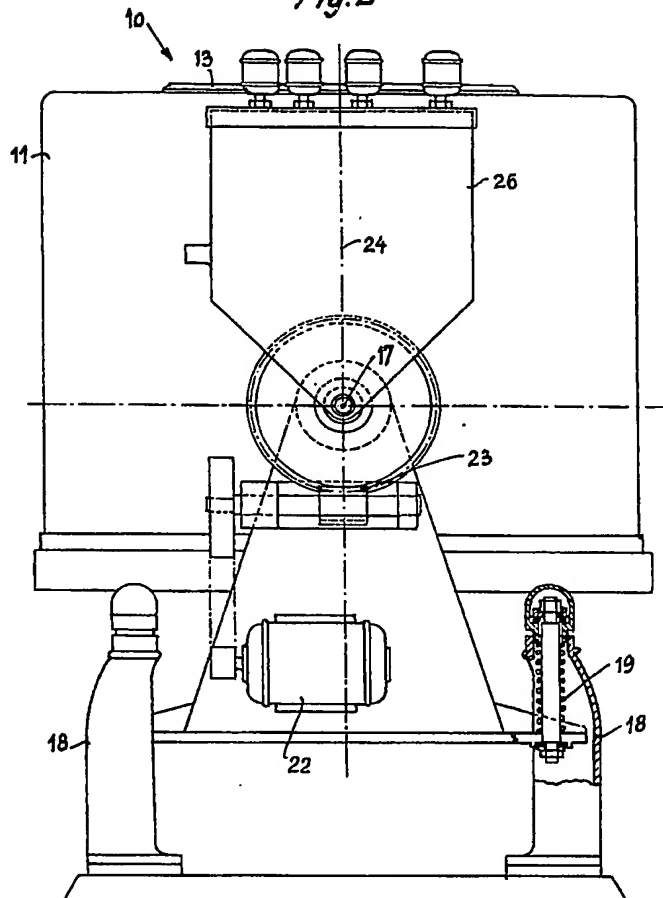
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COMPLETE SPECIFICATION

5 SHEETS

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the Original on a reduced scale
Sheet 2

Fig. 2



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Sheet 3

Fig.3

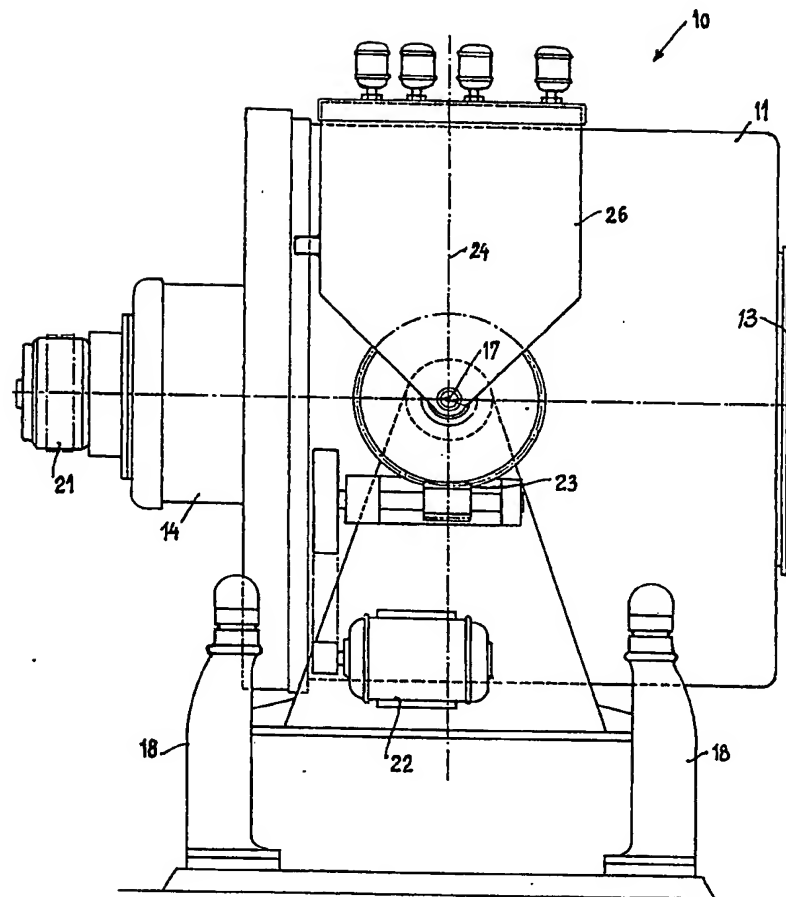


Fig.4

